AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1 CONTRACT ID CODE	PAGE OF PAGES	
J	1	28

2 AMENDMENT/MODIFICATION NO	3 EFFECTIVE DATE	4 REQUISITION/PURCHASE REQ NO	5 PROJECT NO (If applicable)
P00001	02-Nov-2016		

6 ISSUED BY	CODE	7 ADMINISTERED BY (If other than item 6)	CODE
NAVAL SURFACE WARFARE CENTER PH LA (b) (6) 5001 SOUTH BROAD STREET PHILADELPHIA PA 19112	N64498	DCMA HAMILTON SUNDSTRAND 1 HAMILTON ROAD WINDSOR LOCKS CT 06096-0963	S0703A

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
HAMILTON SUNDSTRAND CORPORATION (b) (6) 1 HAMILTON RD MAILSTOP 2-M-1-A WINDSOR LOCKS CT 06096-1000		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MOD. OF CONTRACT/ORDER NO. N64498-16-D-0006
CODE 73030 FACILITY CODE	X	10B. DATED (SEE ITEM 13) 13-Jul-2016

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer ☐ is extended, ☐ is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

☐ A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

☐ B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

☐ C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

X D. OTHER (Specify type of modification and authority)
Mutual agreement of the parties.

E. IMPORTANT: Contractor ☐ is not, ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

Modification Control Number: (b) (6) 1774

The purpose of this modification is to update the DCMA Administering Office in Block 7; update the SOW in Section C; update the delivery schedule for CLIN 0003 in Section F; add performance based payment clause in Section I, and incorporate the DD254 in Section J. All other terms and conditions remain in full force and effect.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) MARIANNE T. CAMPBELL / CONTRACT SPECIALIST TEL: (b) (6) EMAIL: (b) (6)	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. (b) (6) BY _____ (Signature of Contracting Officer)	16C. DATE SIGNED 16-Nov-2016

EXCEPTION TO SF 30
APPROVED BY OIRM 11-84

30-105-04

STANDARD FORM 30 (Rev. 10-83)
Prescribed by GSA
FAR (48 CFR) 53.243

Enclosure 1

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

SECTION A - SOLICITATION/CONTRACT FORM

The 'administered by' organization has changed from

DCMA HARTFORD
130 DARLIN STREET
EAST HARTFORD CT 06108-3234
to
DCMA HAMILTON SUNDSTRAND
1 HAMILTON ROAD
WINDSOR LOCKS CT 06096-0463

SECTION C - DESCRIPTIONS AND SPECIFICATIONS

The following have been modified:

STATEMENT OF WORK

1. SCOPE

This specification defines the performance, physical, design, quality assurance, and test requirements for a Low Pressure Electrolyzer (LPE) for submarine life support service. The LPE is a self-contained oxygen generator that is operated using a programmable logic controller (PLC) based controller. The controller must be built using hardware and software already familiar to the Navy so that the Government can properly manage the configuration of the LPE as requirements change and parts become obsolete.

2. APPLICABLE DOCUMENTS

The following documents are part of this specification to the extent specified herein. Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the Government. In the event of a conflict between the provisions of the contract and supplier's technical proposal, the contract shall take precedence. Nothing in this specification, however, shall supersede applicable Federal, State, or local laws and regulations unless a specific exemption has been obtained.

2.1 Federal Specifications and Standards

A-A-59155	NITROGEN, HIGH PURITY, SPECIAL PURPOSE
TT-C-490	CHEMICAL CONVERSION COATINGS AND PRETREATMENTS FOR METALLIC SUBSTRATES (BASE ORGANIC COATINGS)

2.2 Military/DOD Specifications

MIL-A-15303	AUDIBLE SIGNALS: ALARMS, BELLS, BUZZERS, HORNS, AND SIRENS, ELECTRONIC, SHIPBOARD
MIL-B-17931	BEARINGS, BALL, ANNULAR, FOR QUIET OPERATION

MIL-DTL-2212	CONTACTORS AND CONTROLLERS, ELECTRIC MOTOR AC OR DC, AND ASSOCIATED SWITCHING DEVICES
MIL-C-5015	CONNECTORS, ELECTRICAL, CIRCULAR THREADED, GENERAL SPECIFICATIONS FOR
MIL-DTL-17361	CIRCUIT BREAKERS, AIR INSULATED HOUSING (SHIPBOARD USE), GENERAL SPECIFICATION FOR
MIL-DTL-28840	CONNECTORS, ELECTRICAL, CIRCULAR, THREADED, HIGH-SHOCK, HIGH DENSITY, SHIPBOARD, CLASS D, GENERAL SPECIFICATION FOR
MIL-DTL-38999	CONNECTORS, ELECTRICAL, CIRCULAR, MINATURE, HIGH DENSITY, QUICK DISCONNECT, ENVIRONMENT RESISTANT WITH CRIMP REMOVEABLE CONTACTS OR HERMETICALLY SEALED WITH FIXED, SOLDERABLE CONTACTS, GENERAL SPECIFICATION FOR
MIL-DTL-917	ELECTRIC POWER EQUIPMENT BASIC REQUIREMENTS
MIL-F-16552	FILTERS, AIR ENVIRONMENTAL CONTROL SYSTEM, CLEANABLE, IMPINGEMENT (HIGH VELOCITY TYPE)
MIL-M-17059	MOTORS, 60 CYCLE ALTERNATING-CURRENT, FRACTIONAL HORSEPOWER (SHIPBOARD USE)
MIL-DTL-17060	MOTORS, 60 CYCLE ALTERNATING-CURRENT, INTEGRAL HORSEPOWER (SHIPBOARD USE)
MIL-P-15024	PLATES, TAGS AND BANDS FOR IDENTIFICATION OF EQUIPMENT, GENERAL SPECIFICATION FOR
MIL-PRF-15160	FUSES, INSTRUMENT, POWER, AND TELEPHONE, GENERAL SPECIFICATION FOR
MIL-HDBK-217	RELIABILITY PREDICTION OF ELECTRONIC EQUIPMENT
MIL-HDBK-454	STANDARD GENERAL REQUIREMENTS FOR ELECTRONIC EQUIPMENT
MIL-HDBK-472	MAINTAINABILITY PREDICTION
MIL-HDBK-2036	PREPARATION OF ELECTRONIC EQUIPMENT SPECIFICATIONS
MIL-STD-22	WELDED-JOINT DESIGNS

MIL-STD-108	DEFINITIONS OF AND BASIC REQUIREMENTS FOR ENCLOSURES FOR ELECTRIC AND ELECTRONIC EQUIPMENT
MIL-STD-167-1	MECHANICAL VIBRATIONS OF SHIPBOARD EQUIPMENT
MIL-STD-461	CONTROL OF ELECTROMAGNETIC INTERFERENCE CHARACTERISTICS OF SUBSYSTEMS AND EQUIPMENT, REQUIREMENTS FOR THE
MIL-STD-471	MAINTAINABILITY; VERIFICATION DEMONSTRATION/EVALUATION
MIL-STD-740-1	AIRBORNE SOUND MEASUREMENTS AND ACCEPTANCE CRITERIA OF SHIPBOARD EQUIPMENT
MIL-STD-740-2	STRUCTUREBORNE VIBRATORY ACCELERATION MEASUREMENTS AND ACCEPTANCE CRITERIA OF SHIPBOARD EQUIPMENT
MIL-STD-882	STANDARD PRACTICE FOR SYSTEM SAFETY
MIL-STD-889	DISSIMILAR METALS
MIL-STD-901D	SHOCK TESTS HIGH IMPACT SHIPBOARD MACHINERY, EQUIPMENT, AND SYSTEM REQUIREMENTS
MIL-STD-1310	SHIPBOARD BONDING, GROUNDING, AND OTHER TECHNIQUES FOR ELECTROMAGNETIC COMPATIBILITY AND SAFETY, STANDARD PRACTICE FOR
MIL-STD-1399	INTERFACE STANDARD FOR SHIPBOARD SYSTEMS
MIL-STD-1472	HUMAN ENGINEERING
MIL-STD-1622	CLEANING OF COMPRESSED AIR SYSTEMS, STANDARD PRACTICE FOR
MIL-STD-2073-1	STANDARD PRACTICE FOR MILITARY PACKAGING
MIL-STD-2219	FUSION WELDING AEROSPACE APPLICATIONS

2.2 NAVSEA Specifications

S9074-AR-GIB-010/278	REQUIREMENTS FOR FABRICATION WELDING AND INSPECTION, AND CASTING INSPECTION AND REPAIR FOR MACHINERY, PIPING, AND PRESSURE VESSELS

2.3 Other Specifications

American Welding Society	SPECIFICATION FOR FURNACE BRAZING C3.6:1999
DoDI 8500.01	CYBERSECURITY
IEEE/EIA 12207	SOFTWARE LIFE CYCLE PROCESSES
SAE AS22759	WIRE, ELECTRICAL, FLUOROPOLYMER INSULATED, COPPER OR COPPER ALLOY

2.4 **NAVSEA Drawings**

8181047	OHIO CLASS TRID 0565 PIPING OXYGEN GENERATORS 1 & 2 – LOW PRESSURE ELECTROLYZER

3. REQUIREMENTS

3.1 General. The LPE shall be a self contained electro-chemical oxygen generating plant. Performance characteristics are defined below.

3.1.1 Electrolysis. The electrolysis process produces oxygen. Design of the electrolysis process shall be based upon existing and proven proton-exchange membrane electrolysis-cell processes to the greatest extent possible. A backup electrolysis cell is not required to be integrated into the LPE. The LPE shall provide filters and a demineralizer internal to the unit prior to the electrolysis cell to provide a water quality required to meet the 30,000 hour cell life requirement of para. 3.2.3. All filters and the demineralizer shall be fully accessible and removable for routine maintenance. Filters shall provide a means of indication to inform the operator that the filter needs cleaning or changing. The demineralizer filter bed shall be designed to last for more than 100 days of continuous operation. The demineralizer bed shall also provide a means of indication to inform the operator that the bed needs cleaning or changing.

3.1.1.1 Cell Design. The cell shall be capable of supporting performance, life and reliability as specified herein. The design shall be compact in size and volume and shall be based upon the minimum number of cells to meet the capacity stated in para. 3.1.1.2. The electrolysis cell membrane material must be able to support performance, life and reliability requirements as specified herein. The cell materials shall be selected to provide maximum safety and compatibility. The fluoride's level shall be less than 20 parts per billion (ppb).

3.1.1.2 Oxygen Production. There shall be two types of LPE. The 225 SCFH LPE shall be capable of producing 225 SCFH of gaseous oxygen. The 170 SCFH LPE shall be capable of producing 170 SCFH of gaseous oxygen. The two types of LPE shall be identical in all ways outside the electrolysis module. Type of LPE shall be specified in procurement ordering documentation. Oxygen shall be discharged from the LPE at ambient pressure and have a due point of less than 60 F. The LPE shall be capable of production settings ranging from 15 to either 225 SCFH or 170 SCFH. The quantities and variability of the settings shall be determined during detailed design. The oxygen purity at the point of discharge shall be a minimum of 99.0% at the point of discharge. For the purposes of this specification, standard temperature and pressure at which SCFH shall be calculated is 70 F and 1 atm. The LPE shall be designed such that a 170 SCFH cell stack and a 225 SCFH cell stack are interchangeable. Any components required to make the change shall be provided.

3.1.2 Hydrogen Disposal. The hydrogen produced by the electrolysis process shall be available for disposal at pressures up to 750 psig. The use of pumps and compressors to achieve pressure for discharge is not permitted. Ambient discharge of hydrogen into the ship shall be limited to an average rate of 3.25 SCFM. The rate of hydrogen inboard discharge shall be limited to 30 SCFH for no longer than 15 minutes. A means shall be provided to discharge hydrogen to ambient which will meet safety and performance goals specified herein. The LPE shall have a gauge from which the pressure at which hydrogen is being disposed at can be monitored.

3.1.3 Nitrogen Usage. The Contractor shall design the LPE to minimize the use of gaseous nitrogen. The design shall provide isolation between the ship's supply of nitrogen and the LPE to minimize the quantity of nitrogen lost if there is a leak within the LPE. The LPE shall be capable of holding a supply of nitrogen within the unit for purging due to shutdowns. The amount of nitrogen needed to purge the LPE shall be less than 200 SCF.

3.2 Functional Requirements.

3.2.1 Performance Characteristics.

3.2.1.1 Size. The LPE shall use the existing Electrolytic Oxygen Generator (EOG) foundation currently in place aboard OHIO Class submarines, up to and including the mounting bolt locations in the EOG base plate. The LPE footprint shall be kept to a minimum, consistent with the required sturdiness, serviceability, safety and reliability. The footprint of the LPE shall be less than 32.5 x 40.5 inches. Height of the LPE shall be less than 75 inches.

3.2.1.2 Hatch and Door Requirement. The LPE shall be constructed such that items will pass through a 30 inch diameter hatch. Shipboard replaceable items and subassemblies, which may be stowed onboard ship, shall be able

to pass through a minimum of 18 inch x 6 foot 3 inch passageway. Reassembly of LPE subassemblies via bolted construction is preferred. The LPE shall be divided into cabinet subassemblies, each of which will pass through a 30-inch diameter hatch. Each cabinet (i.e. electrolysis power supply) may only be divided into a maximum of six (6) subassemblies when initially installing on submarines. Subassemblies shall be minimized as much as possible. Pins shall be provided to facilitate alignment of components.

3.2.1.3 Weight. The wet weight of the LPE including a water-charged electrolysis cell module shall be less than 4,500 lbs. Items and assemblies in excess of 80 lbs shall be equipped with lifting aids (e.g., eyebolts). Access panels or doors weighing more than 40 lbs shall be provided with alignment pins and handles to facilitate reinstallation of access panels or doors.

3.2.1.4 Electric Power Interface. Electric power will be provided to the LPE by the ship's generation and power distribution system as defined below. The LPE will be provided with 440 VAC, 3 phase main power and 115 Vrms, single phase control power. The equipment shall operate in accordance with MIL-STD-1399, Section 300A.

(a) AC Power. The AC power available from the ship's service power buses is Type I power per MIL-STD-1399, section 300A. The AC equipment service is 440 Volt, 60 Hz, and 115 Volt, 60 Hz. Equipment shall be fully operational within the normal tolerance limits specified for Type I power. Equipment may shut down or go into standby condition, but not be damaged, when operating outside these limits. See para. 4.6.6.1.

(b) Maximum Power Limit. The LPE shall use less than 117 kVA of power.

(c) Analog/Digital Interfaces. Provisions shall be made to transfer analog or digital interface signals to or from the LPE for the following:

(1) A remote emergency stop ("kill") switch shall be provided in the design of the LPE and will be located in the ship's arrangement just outside of the AMR compartment.

(2) The LPE shall allow recording of historical data stored in the LPE's CPU to download data for failure analysis to a portable data recorder. The LPE shall transmit time and date of a system failure/shutdown as well as information on temperature, pressure, and flow rates which may aid in a failure analysis.

(d) Cable Interface. Provisions shall be made for the entry of the electric power and control cable interface to the top of the unit or as approved by the Government.

(e) Circuit Breaker Control Interface. The LPE power and control subsystem shall be equipped with a circuit breaker unless otherwise approved by the Government.

3.2.1.5 Fluids Interface. The fluids interface shall be as follows:

(a) Oxygen. Oxygen produced by the LPE shall be directed to the ship's atmosphere at a discharge pressure specified in para. 3.1.1.2 and shall discharge out of the top of the unit.

(b) Demineralized Water. Demineralized water will be provided to the LPE at a maximum flow rate of 0.5 GPM for short term filling and general maintenance. A maximum flow rate of 0.1 GPM will be provided to the LPE during normal operation. The demineralized water delivery pressure to the LPE will be 25 psig to 40 psig with a maximum design temperature of 122 F. The LPE piping from the demineralized water supply shall be designed to withstand 60 psig. An isolation valve will be provided by the Government on the demineralized water inlet pipe to the LPE. The LPE shall be equipped with a 3/8" tube socket union fitting (SSP Part No. 6KSWU or similar) for connection to the demineralized water system piping. Demineralized water quality is available to the LPE as follows:

(1) Conductivity – 2.5 micromho/cm maximum

(2) pH – 5.7 to 8.0

(3) Visual clarity – No turbidity, oil, sediment, or resin beads

(4) Chlorides – Maximum 0.1 ppm

(c) Electronic and Auxiliary Fresh Water. The Electronic and Auxiliary Fresh Water (EAFW) system will provide a supply of fresh water to the LPE at a flow rate of 5 GPM and at a temperature of 95 F +/- 3 F. The conductivity of the EAFW shall not exceed 2.0 micromhos/cm. The EAFW system design pressure will be 125 psia, and the pressure drop across the LPE shall not exceed 10 psi. Maximum EAFW system pressure is 200 psia. Isolation valves will be provided by the Government on both the EAFW inlet and outlet pipes. The LPE shall be equipped with 5/8" tube socket union fittings (SSP Part No. 10KSWU or similar) for connection to the EAFW system piping.

(d) Chilled Water. Ship's chilled water (CHW) is available at 45 F +3 / - 2 F and may be used for general cooling of the LPE. The total flow rate to the LPE will be limited to 15.5 GPM and controlled between 3 and 15.5 GPM to maintain LPE temperature control. The Contractor shall attempt to minimize the CHW usage. The ship's CHW flowrates may fluctuate by +/- 10%. The CHW design system pressure is 150 psig, and the LPE shall be designed to operate and control temperature based on a differential pressure of 35 psi measured between the ship's supply and return headers. The LPE shall be equipped with welded socket fittings (CPV Part No. 51R-4 Tailpiece to Part No. 50N-4 Nut or similar), for connection to ship's CHW system.

(e) Hydrogen Inboard Purge Connection. The LPE may provide a hydrogen gas inboard purge union connection to vent hydrogen to ambient via ship's piping, during LPE shutdown. Average flow rate of the hydrogen during discharge periods shall be limited to 3.25 SCFM.

(f) LPE Drain System. The LPE shall provide a suitable drain system for waste water and condensates which will be drained to the ship's existing gravity drain system.

(g) Mating Fluids Interface Connections. The Contractor shall supply separately, unless otherwise specified by the Government, all mating union connections and tailpieces/adapters, except for the hydrogen gas overboard connection, which are to be welded to the corresponding ship's interface pipe by the Government. The tailpieces/adapters must use the same material as the corresponding ship interface pipe to which it will be welded, or as approved by the Government.

3.2.1.6 Interface Locations. The LPE shall connect directly to EOG existing piping aboard OHIO Class submarines whenever possible or as approved by the Government. NAVSEA Drawing 8181047 shall be used as reference. All piping connections shall be located on the "FWD" side of the LPE Configuration, as illustrated in Figure 1 in Paragraph 3.2.7.2. The electrical interface for the LPE shall be on top of the unit or as approved by the Government.

3.2.2 Design Characteristics

3.2.2.1 Ambient Pressure. The equipment shall operate in accordance with all performance requirements at an ambient pressure of 11.8 – 17.6 psia (0.8 – 1.2 atm), and shall not be damaged when subjected to a maximum pressure of 29.4 psia (2.0 atm). The maximum rate of change in ship's pressure is 2" of Hg/min.

3.2.2.2 Temperature. The equipment shall operate in accordance with all performance requirements at ambient temperatures between 40 F and 100 F. In a non-operating mode, equipment shall not be damaged at ambient temperatures between 40 F and 122 F.

3.2.2.3 Humidity. The equipment shall operate in accordance with all performance requirements at 95 percent relative humidity (non-condensing).

3.2.2.4 Vibration. The LPE shall meet the requirements of Type I environmental vibration of MIL-STD-167-1. The equipment shall remain in operational during vibration testing.

3.2.2.5 Shock. The LPE shall meet Grade A shock requirements in accordance with MIL-S-901D, Interim Change No. 1. Equipment operation shall not be affected to the extent that the equipment is unable to perform its function during and after shock testing in accordance with MIL-S-901D, Interim Change No. 1. The use of shock, noise, or vibration isolation or shock mitigation devices shall require Government approval.

Testing to MIL-S-901D Interim Change #1 is allowed provided that the shock test of the equipment meets the intent of the shock requirements for each submarine class. By shock testing in accordance with MIL-S-901D Interim Change #1, the following shock requirements will be satisfied:

a. MIL-S-901C, Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for; of 15 Jan 1963, as modified by the SSBN-726 ship specifications (Pub. NAVSEA 0902-LP-027-7010, section 9400-1) for SSBN-726 Class.

b. MIL-S-901C, Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for; of 15 Jan 1963, as modified by the SSBN-726 ship specifications (Pub. NAVSEA 0902-LP-027-7010, section 9400-1) and SSGN Conversion Ship Specification Addendum for SSGN-726 Class.

c. PPD No. 802-6335704, Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment, and Systems, Requirements for; of 1 May 1987 for SSN-21 (SEAWOLF) Class.

3.2.2.6 Airborne and Structureborne Noise. The structureborne noise generated by the LPE when operating at 120 and Max SCFH shall not exceed that shown in Appendix A for steady state structureborne noise levels. Equipment generated airborne noise shall be in accordance with Table I of MIL-STD-740-1, Grade D.

3.2.2.7 DC Magnetic Fields. The equipment shall operate in accordance with MIL-STD-1399 Section 070.

3.2.2.8 Electromagnetic Emissions and Susceptibility. Equipment shall meet and demonstrate compliance with the requirements of MIL-STD-461 Revision E dated 20 August 1999 for Submarines, Internal to Pressure Hull installations and Methods RS02 (part 1 – magnetic induction spike) & CS06 of MIL-STD-461C. The standoff distance specified in RE101 is increased from 7 cm to 61 cm for all directions except above the unit and in front of the unit. Above the unit the standoff distance is increased from 7 cm to 10 cm. In front of the unit the standoff distance is increased to 100 cm. Para. 4.2.4.2 of MIL-STD-461E shall not be interpreted to mean that a power supply qualified to previous EMI standards can be installed aboard a ship class other than the ship class it was originally procured for.

3.2.2.9 Boat Motion and Attitude. The equipment shall be designed and installed to operate satisfactorily when inclined 45 degrees from the vertical. Inclination testing shall be for both the fore-aft and athwartship orientation.

3.2.3 Life Expectancy. As a design goal, the equipment shall have a total life expectancy of 33 years, when maintained in accordance with the maintenance instructions, and with a major overhaul allowed after 15 years. All pumps and rotating mechanical components with routine maintenance shall have a life expectancy of 20,000 hours. Electrical components and other major mechanical components shall have a life expectancy greater than 20,000 hours. The life expectancy of the electrolysis cells shall be greater than 30,000 hours and shall have a maximum average voltage drop per electrolysis cell of 3 volts at end of life. The 30,000 hour life expectancy for electrolysis cells shall be calculated using the maximum LPE production figure.

3.2.3.1 Shelf Life. The LPE components shall be able to meet all the requirements specified in this specification for the following conditions:

(a) Storage Life – When delivered to the Government, the LPE shall be able to be stored for up to 5 years before installation or use on the ship. Critical components which need special storing, handling or maintenance may be packaged separately and shall be provided with instructions on how to store, handle or be maintained properly.

(b) Standdown – The LPE shall be able to withstand a non operational use while the ship is docked for a period of 3 months without any disassembly of components. Critical components which will require special maintenance and handling shall be provided with instructions on how to handle or maintain properly.

(c) Mothballing – The LPE shall be able to withstand a non operational use while the ship is docked for longer than 3 months. Disassembly of components is allowed. Critical components which need special storing, handling or maintenance may be packaged separately and shall be provided with instructions on how to store, handle or be maintained properly.

3.2.4 Reliability. The LPE shall have a minimum mean-time-between-failure (MTBF) of 2,000 hours. A reliability prediction shall be performed to the requirements of MIL-HDBK-217.

3.2.5 Maintainability. The complete LPE shall have a mean time to repair (MTTR) of not more than five hours except where affected components require a pressure test and/or a cool down period. Components that must be cooled and/or pressure tested shall have an MTTR of not more than fifteen hours. MTTR includes trouble shooting and repair time. A prediction for MTTR shall be performed using MIL-HDBK-472.

3.2.6 Heat Rejection. The LPE shall be designed to minimize total heat rejection to the electronic auxiliary cooling water, chilled water, and the ambient air.

3.2.7 LPE Controls and Operability. The LPE controls and operability shall meet the requirements defined in the following paragraphs.

3.2.7.1 LPE Control Power Interruption. The LPE control system shall be designed to preclude failure or damage to any LPE component due to a temporary loss of power. Such an interruption could occur with an ABT transfer of 115 Volt shipboard buses. In the event of a transfer of this nature, shut down of the LPE is allowed and the unit must shut down safely.

3.2.7.2 Controls and Operator Interface. All controls and indicators required for normal operations shall be located on the front side of the LPE. See Figure 1 for OHIO Class Configuration. Valves required for normal operation shall be readily accessible (behind hinged panels if necessary). The control interface system shall consist of a display and control panel. The display will provide operating parameters, system and failure messages, and diagnostic information to assist in operation, maintenance, and troubleshooting of the LPE. The controls shall include indicator lights for LPE status and critical operating functions. The control panel shall provide all of the necessary functions to operate and control the LPE. The LPE shall provide visual indicators to allow for limited continuous operation in the event of a display system failure, or as approved by the Government. If volatile memory is capable of being lost due to a loss of power to the LPE, then a 72 hour battery backup capable of saving volatile memory shall be provided by the LPE. The controller shall be capable of system diagnostics to warn or alert the operator of potential problems. The LPE alarms shall conform to MIL-A-15303, and shall be capable of being silenced by the operator.

The controller shall be capable of system diagnostics to warn or alert the operator of potential problems. The LPE alarms shall conform to MIL-A-15303, and shall be capable of being silenced by the operator.

F
T


Figure 1. OHIO Class Configuration Reference

3.2.7.3 Controller Hardware. The LPE Controller shall be built using the Rockwell 1769 Series Control platform. A report detailing the preliminary design of the Controller shall be submitted to the Government for review and approval (DD1423 A044). The controller system shall incorporate hard wired sensors to shut down independently as appropriate for safety. The electrolyzer shall continue to operate safely without the HMI operational.

3.2.7.4 Controller Software. The software installed on the LPE Controller shall be written using RSLogix 5000 v. 20.0. The Government shall have a copy of the software program with the ability to maintain configuration control and to make changes to address Cyber security and safety issues to the software installed on the LPE Controller. The Contractor shall provide a copy of the program installed on the LPE Controller (DD1423 A0045). The Government's rights in technical data and computer software shall include but not be limited to the foregoing.

3.2.7.5 Design Analysis. The Contractor shall submit to the Government for review and approval an analysis of the proposed LPE operator interface. This report shall include a detailed description of each function, mode of operation and interaction between these modes. The report shall then describe (with both written descriptions and diagrams) the proposed operator interface for each of these functions, and what will occur if the interface is used improperly or fails. For programmable/interactive interfaces, the report shall also detail how and under what conditions the operator can initiate actions, and for each action what occurs to the interface. The report shall also contain information concerning viewability, character font size and type, choice of icons(s), mnemonics, etc., that will be in the proposed interface. The Contractor shall perform the following design analyses, development plan, and system specifications for the following unless otherwise specified in the Contract. The format content for each report shall follow the respective MIL STD format, unless otherwise approved by the Government.

- Software Development Plan (SDP) (DD1423 A006) in accordance with IEEE/EIA 12207
- Reliability Prediction (DD1423 A002) in accordance with MIL-HDBK-217
- Software Requirements Specification (SRS) (DD1423 A003) in accordance with IEEE/EIA 12207
- Failure Modes, Effects, and Criticality Analysis (FMECA) (DD1423 A004) in accordance with MIL-STD-882
- System Safety Hazard Analysis Report (SSHA) (DD1423 A005) in accordance with MIL-STD-882

3.2.7.6 Controls, Instrumentation and Safety Circuits. The LPE shall contain all necessary controls, and instrumentation and safety circuits required to ensure safe and reliable unattended operation after initial start-up. The LPE shall be designed so that installation, operation, inspection, maintenance and adjustment can be accomplished without causing injury or damage to the equipment. No double failure shall cause a personnel hazard. The LPE shall be designed so that one failure or anomaly that may produce an unsafe condition will shut down the LPE. The LPE shall be designed so one failure does not cause a ripple effect. The control system shall continually monitor critical mechanical and chemical processes, and in the event of a problem or malfunction, shall place the LPE in a fail-safe shutdown condition. The control system shall report the cause of the shutdown, and shall save the status of the various controls and sensors in memory. No improper switch or valve actuation shall cause a casualty.

The LPE control system shall provide the necessary circuitry and interface connectors to allow the unit to be shut down remotely.

3.2.7.7 Deleted

3.2.7.8 Failure Recording. The LPE shall record operational data once every minute. The past 30 minutes of data will be available for review by the operator. When one of the following events occurs, the LPE shall automatically save the prior 30 minutes of data. Saved data shall be available for download through the LPE USB port or review by the operator. The LPE shall be capable of saving data from up to the past 100 events.

(a) Message displayed

(b) Operation mode change

(c) Failure

3.2.8 Human Engineering. The unit shall meet the human engineering requirements specified in MIL-STD-1472 unless otherwise specified herein. In general the unit shall be designed for ease of operation and maintenance. Design of the unit shall reflect efficient arrangement of equipment, control and displays to ensure optimal task performance. Equipment design shall provide for adequate physical, visual, auditory and other communication links between personnel and equipment under both normal and emergency conditions. Controls, displays, markings, coding, labeling and arrangement schemes (equipment and panel layout) shall be uniform for common functions of all equipment. Where off-the-shelf equipment requires modification in order to interface with other equipment, the modification shall be designed to comply with the criteria contained in MIL-STD-1472.

3.2.9 Safety. In general the unit shall conform to the safety standards issued by the Occupational Safety and Health Administration (OSHA). Safety features shall be incorporated into the unit to prevent damage to equipment and ensure optimal personnel protection. An operating safety analysis shall be performed to identify activities or operations which have the potential for injury to personnel or damage to equipment. The area of the analysis shall include, but not be limited to the following:

(a) Specific safety installation requirements

(b) Specific safety testing requirements

(c) Specific operating/maintenance requirements including impact on submarine atmosphere control

(d) Specific safety handling requirements

(e) Specific training requirements

3.3 Materials and Processes

3.3.1 Materials. Contractor and Suppliers shall be governed by these requirements.

(a) Corrosion. Metals and alloys shall be corrosion-resistant or shall be given a corrosion-resisting treatment or coating. Incompatible metal combinations, as identified in MIL-STD-889, shall be protected

(b) Toxic hazards. The equipment shall be designed to prevent exposure of personnel to toxic substances. The design of the LPE shall provide control and leak detection methods required to prevent exposure and to alert personnel of a leak of hydrogen into the ship's atmosphere.

(c) Prohibited. The materials listed on the Submarine Material Control List (SMCL) as prohibited shall not be used. Trace amounts of Mercury in backlights is allowed in color displays.

(d) Exclusions. Brittle materials are of concern due to performance under shock and fatigue. General guidance is provided in the notes section of MIL-S-901D, Interim Change No. 1 and modifications for elongation requirements. Zinc alloy and magnesium alloy castings shall not be used. Aluminum wire shall not be used.

(e) Flammability. Equipment shall be noncombustible or fire retardant under the most hazardous conditions to be expected in the application. Fire retardance shall not be achieved by use of nonpermanent additives to the equipment. Internal cable and wire flammability shall conform to the requirements of SAE AS22759.

(f) Recovered Materials. Unless otherwise specified, all equipment, material, and articles incorporated in the products covered by this specification shall be new and shall be fabricated using recovered materials to the maximum extent practicable where cost effective. Recovered materials are materials that have been collected or recovered from solid waste and reprocessed to become a source of raw materials.

3.3.2 Processes

3.3.2.1 System Cleaning. The following LPE systems (i.e., the demineralized water, nitrogen, hydrogen gas and oxygen) must be thoroughly cleaned of all foreign matter prior to operational tests in accordance with MIL-STD-1622, or as approved by the Government. The electrolysis cell, due to its special materials, shall be cleaned in accordance with a Supplier procedure approved by the Government. (DD1423 A30)

3.3.2.2 Assembly. The LPE shall be assembled in a clean work area. All tools, fixtures, test equipment, etc., shall be clean and free of oil, and grease. Test fixtures operated within the oxygen clean boundary must also be oxygen clean. The LPE assembly area shall be segregated from all non-clean fabrication/assembly areas.

3.3.2.3 Welding and Brazing. All welding and brazing shall conform to NAVSEA S9074-AR-GIB-010/278. Pressure vessels shall be class A-2 and process piping shall be class P-1. Welded joints shall conform to MIL-STD-22. The following exceptions are noted below:

(a) Shell and tube heat exchanger braze joints, which are not accessible and do not meet the requirements of paragraphs 5.21, 5.2.2 and 9.1.5(c) of NAVSEA Specification 0900-LP-001-7000, shall be hydrostatic tested in lieu of ultrasonic inspection.

(b) MIL-STD-2219 may be used in lieu of NAVSEA S9074-AR-GIB-010/278 for welding aluminum material.

(c) The power supply shall be welded in accordance with MIL-STD-2219 or as approved by the Government.

(d) Furnace Brazing of temperature sensor housings and plugs shall be in accordance with AWS C3.6 or as approved by the Government.

(e) Vacuum furnace brazing of chilled water blocks and tubing shall be in accordance with AWS C3.6 or as approved by the Government.

3.3.2.4 Soldering. Soldering shall be in accordance with MIL-HDBK-454A

3.3.2.5 Painting. Before any coat is applied, bare spots on the previous coat shall be "touched up" and the entire surface allowed to dry thoroughly.

(a) Aluminum and aluminum alloy pretreatment. The basic metal shall be cleaned to remove grease, oil, welding flux, or other foreign matter. The components shall receive a chemical conversion coating.

(b) Ferrous metal pretreatment. After all machining, welding, and brazing operations are completed, rust or other corrosion products and flux shall be removed by abrasive blasting, sanding, wire brushing, or other mechanical means. Surfaces shall be cleansed of all grease, oil, and dirt by solvent wiping and rinsing, vapor degreasing, or caustic washing followed by rinsing. Ferrous metals shall then be pretreated in accordance with type I or III of TT-C-490.

(c) Coatings. Framing, electrical boxes, and other miscellaneous structural components that require corrosion protection, may be epoxy-powder coated, if they meet the following criteria:

(1) Parts must be small enough to fit in the curing oven.

(2) Parts must not be adversely affected by heating to process temperatures or by other process conditions.

(3) Powder coating of fasteners is not authorized. If powder coating cannot be used the parts shall be painted.

(4) Powder coating that are categorized as prohibited on the SMCL shall not be used.

(d) Plating. Cadmium plating of fasteners is allowed.

3.3.3 Electrical/Electronics Component Selection. Electronic and electrical equipment shall meet the requirements of MIL-E-917E.

3.3.3.1 Electronic Component Derating. In the application of electronic parts and materials, the parts and materials selected shall be used within their electrical ratings and environmental capabilities (e.g., any ambient or hot spot temperatures, voltage, current, or power dissipation). Derating shall be accomplished as necessary to assure the required equipment reliability within the specified operating conditions.

3.3.3.2 Electrical Connectors. The types of electrical connectors that shall be utilized are MIL-C-38999 Series 111, MIL-C-5015 Series 3400 Class D and/or MIL-C-28840. A request for waiver of these requirements can be submitted to the Government for specific circumstances. Shipboard interface connectors shall be selected as specified in MIL-STD-1683, which lists all standard electrical connectors.

3.3.3.3 Electric Motors and Associated Controllers. Electric motors and associated controllers shall be in accordance with, MIL-C-2212, MIL-M-17059 and MIL-M-17060 as applicable. Exhaust and recirculating fans, pumps and blowers shall be driven by AC induction motors. Non military specification motor driven auxiliaries or motors for special applications, shall be approved by the Government.

3.3.3.4 Electromagnetic Interference Filters. Where EMI filters are required, line-to line filters are preferred to line-to-ground filters. AC line-to-ground capacitance shall be in accordance with MIL-STD-1399, Section 300A and MIL-STD-461E. EMI filters shall be located on the load side of the power on/off switch where practical.

3.3.3.5 Personal Safety Leakage Current. The equipment shall comply with Appendix B of MIL-HDBK-2036 and paragraph 5.2.4 of MIL-STD-1399 Section 300A. The value of input filter capacitance to ground shall not exceed 0.1 uF per phase for 60 Hz equipment. On equipment which has an unavoidable leakage current in excess of 5 milliamperes a warning plate shall be attached to the front panel and read as follows:

"DANGER: Do not energize this equipment unless frame and all exposed metal parts are grounded."

3.3.3.6 Protective Shields. Protective shields shall be provided to protect personnel from accidental contact with parts in excess of 30 Vrms or 30 VDC during operation or maintenance actions. The electrolysis cell module shall be provided with warning labels stating that the module is charged (see para. 3.3.5.3).

3.3.3.7 Grounding. Equipment shall be grounded in accordance with MIL-STD-1310. Equipment shall be suitable for operation in each operating mode with any one of the three phase input power lines shorted to ground. Grounding shall be tested in accordance with para. 5.3.5 of MIL-STD-1399, section 300.

3.3.3.8 Internal Wiring Practices. Internal wiring practices shall be in accordance with MIL-HDBK-454.

3.3.3.9 Power Supply Design. The power supply shall be in accordance with MIL-HDBK-2036. The power supply shall be compatible with the ship's power supply as defined in 3.2.1.4. Power supplies shall not be damaged by any load between an open circuit and a short circuit.

3.3.3.10 Electrical Protective Devices. Electrical protective devices where used as circuit breakers shall conform to MIL-C-17361 and fuses shall be in accordance with MIL-PRF-15160.

3.3.3.11 Instrumentation. As a minimum, the following instruments shall be provided.

(a) Electrolysis cell stack and major component electrical power consumption (if not provided on the display).

(b) Indicator lights shall be provided on the LPE interface control panel to alert the operator on the following functions:

(1) Electrolysis process operating light on when in operation, and off when not in operation

(2) A blinking light to alert the operator of a potential shut down or other pending corrective actions

(3) A light to alert the operator that each function is in shut down and/or purge mode

(4) Audio alarm indication light shall be provided to indicate that the unit's alarms have been inhibited

3.3.3.12 Hardware Shutdowns. The LPE shall be equipped with hardware shutdown mechanisms that are independent of the software. These mechanisms shall ensure that the generator shuts down safely when a potentially unsafe operating condition is detected.

3.3.3.13 Insulation Resistance. Insulation resistance shall be in accordance with the requirements of MIL-HDBK-2036 except as noted below or as approved by the Government.

3.3.3.14 Dielectric Withstanding Voltage. Dielectric withstanding voltage shall be in accordance with the requirements of MIL-HDBK-2036 or as approved by the Government.

3.3.4 System Mechanical Design

3.3.4.1 Enclosures. The cabinet enclosures for the LPE shall be rigid and of adequate strength to support and maintain alignment of the assembled components. The enclosures shall be capable of venting the overpressure from an internal detonation without coming adrift. Equipment enclosures shall be in accordance with MIL-STD-108 and MIL-HDBK-2036. The degree of enclosure shall be drip proof to 45 degrees. The exterior and interior surfaces of metallic enclosures shall be painted as specified herein, except the interior of treated aluminum enclosures need not be painted. Corrosion resistant enclosures are not required to be painted. Prior to painting, the applicable pretreatment and primer shall have been completed.

3.3.4.2 Ventilation. The LPE cabinet(s) shall be designed to minimize and disperse the build-up of explosive vapors within the cabinet. The LPE shall provide sensing devices to determine gas leaks within the unit. The LPE shall shut down all gas producing processes safely and alert the operator when a potentially dangerous gas leak is detected. Ventilation fans shall automatically turn on to disperse gas leaks, once they have been detected. Ventilation fan selection and actuation shall comply with safety requirements specified herein. Air filters, if used, shall be removable for cleaning without disassembly of the equipment. Air filters shall be in accordance with MIL-F-16552.

3.3.4.3 Piping Design. The demineralizer will be allowed to use a tapered pipe thread, provided that a tapered thread to straight pipe thread interface fitting is installed. All joints shall be welded in accordance with NAVSEA Specification S9074-AR-GIB-101/278, but parts requiring replacement or maintenance may be mounted with straight-thread or "Koncentric"(TM) union fittings and sealing devices. Fluid system components shall be selected from the existing ILPE and AEOG designs to the extent practical.

3.3.4.4 Bearings. Bearings for use in noise critical applications shall be in accordance with MIL-B-17931 or as approved by the Government. The use of alternate bearings are allowable provided the Supplier meets the acoustic and life requirements defined herein.

3.3.4.5 Drip Pan. The LPE shall incorporate a drip pan under the unit, if required. The drip pan shall be incorporated into the LPE design to the greatest extent possible. Provision for drain connections shall be provided as required to drain any fluid into the ship's drain system. The drip pan shall be arranged so that it can be visibly inspected.

3.3.5 Marking

3.3.5.1 Plates. Identification and information plates are required and shall conform to MIL-P-15024.

An identification plate shall be located on the front of the plant. The label plates shall contain the following data:

(a) Title of equipment

(b) U.S. Navy serial numbers (to be furnished)

(c) Manufacturer's name, model, and serial numbers

(d) Contract or procurement order number

3.3.5.2 Special Equipment Plates. Plates for water pumps, special valves, and flowmeter shall be supplied which contain the following information:

(a) Manufacturer's name

(b) Manufacturer's identification numbers such as model number, part number, size, serial number, etc.

(c) Design characteristics, such as capacity, pressures, heat transfer characteristics, speed, calibration data, horsepower, test pressure, etc.

(d) Contract or procurement order number

All process components and instruments shall be clearly marked with their process-schematic identifying number.

3.3.5.3 Warning Plates. Warning plates shall be installed at critical locations to warn against danger or hazards. Warning plates shall conform to MIL-P-15024.

3.3.6 Computer Software. All software shall be developed in compliance with IEEE/EIA 12207, except that commercial processor is allowed. Requirements of IEEE/EIA 12207 shall be tailored in a cost effective manner with

respect to the needs of the LPE. Software shall not be utilized as the final safety check for over pressure or over temperature fault detection. Computer software components may be individually grouped, developed and controlled as a function of their purpose, including but not limited to failure effects and mission criticality. Computer software and components used in the LPE design shall be built and designed to avoid obsolescence.

3.3.7 Workmanship. Workmanship shall be uniform in quality, and the surfaces shall contain no foreign matter, corrosion, or detrimental defects such as perforations, sharp edges or corners, seams, cracks, laps, dents, raised metal, nicks, scratches, burrs, or other irregularities that might adversely affect performance, reliability, maintainability or safety.

3.3.8 Interchangeability. Shimming is allowed on subassemblies like mounts, where normal manufacturing tolerance ranges are not easily controlled. The use of shims shall be specified and noted on manufacturing drawings. Components used in the LPE shall be interchangeable with other components performing the same function internal to the LPE. In addition selection of components used within the LPE shall be common with other shipboard systems to the greatest extent practical.

3.4 Technical Data. The Contractor shall prepare technical data in accordance with the procurement ordering document and the following paragraphs.

3.4.1 Drawings. The Contractor shall provide equipment drawings detailing the LPE and all major components within the LPE. An interface control drawing detailing the fluid, electrical and mechanical interfaces of the LPE shall be provided. A schematic detailing the connectivity of all major components within the LPE shall be provided. Standard electrical drawings of all wiring within the LPE shall be provided. (DD1423 A006)

3.4.2 Provisioning Data. The Contractor shall provide all provisioning technical documentation (PTD). PTD includes but is not limited to a list of all repair parts to be stored onboard a submarine to support the LPE and a list of all parts needed to support LPE training. (DD1423 A007)

3.5 Logistics

3.5.1 Maintenance. All parts which require inspection, preventive maintenance, or replacement in service, shall be accessible, with the minimum practicable need for disconnection or removal of another part or assembly. Access panels, covers, inspection ports, etc., may be used. Any removable access panels weighing more than 40 lbs shall be provided with alignment pins. All shipboard repairable or replaceable components shall have mechanical fittings to ease in maintenance.

3.5.2 Accessibility. The LPE shall be provided with adequate openings with removable covers/doors in the frame to allow access to subassemblies such as pumps, blowers, coolers, filters, heaters, as necessary to allow for periodic maintenance and troubleshooting.

3.6 Standard and Special Support Equipment. Where practical, test and troubleshooting functions shall be integrated into the design of the LPE to minimize the reliance upon Special Test Equipment (STE). Use of standard support equipment shall be identified, including modes or conditions during which it is needed. (DD1423 A008)

3.7 Cybersecurity

3.7.1 Cybersecurity Authorization. The LPE shall have a valid authorization as defined in DoDI 8500.01.

3.7.2 Location of Data Ports. All data ports shall be located behind a panel secured by bolts to control access to needed physical digital ports in accordance with DODI 8500.01. Any unused data ports shall be physically disabled.

3.7.3 Password Protection. The LPE software shall be password protected. The software application shall start automatically on power-up and run under a restricted user account without requiring entry of a password. This account shall only be used for normal operation. User access to the system for maintenance or any other activity that is not normal operation shall require entry of a password. The LPE shall require an administrator account and

password for downloading data, default password changes, settings changes, software updates, and any other software action not described above. The Contractor shall supply the Government with the default administrator user name and password.

3.7.4 Secure Coding Practices. The Contractor shall provide documentation on their use of secure coding practices within their proposed security controls. This includes coding standards to be referenced, developer training, and the proposed method of compliance testing.

3.7.5 Security Patches. All COTS software shall be delivered with the latest security patches.

3.7.6 Wireless Networks. The LPE shall have no wireless capabilities.

3.7.7 Restore Point. The LPE software shall provide a method to restore to a known trusted state onboard the platform.

4. QUALITY ASSURANCE

4.1 Responsibility for Inspection. Unless otherwise specified in the contract, the Contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities provided they meet the requirements specified herein. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements. All quality and safety assurance operations performed by the Supplier will be subject to Government verification at any time.

4.1.1 Responsibility for Compliance. The inspections set forth in this specification shall be made part of the Supplier's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the Supplier of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with the requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Design Certification. Any change to the design or material which may affect the equipment's ability to meet one or more of the environmental or performance requirements shall require approval by the Government.

4.1.3 Quality Assurance

4.1.3.1 Quality Assurance Program. The Supplier shall have a quality assurance program in accordance with IS0 9000 or similar.

4.1.3.2 Software Quality Assurance. All software or firmware developed for the LPE shall be reviewed, tested and controlled in accordance with the tailored requirements of IEEE/EIA 12207.

4.2 Classification of Inspection. The inspection requirements specified herein are classified as follows:

(a) First article inspection (see para. 4.3)

(b) Quality conformance inspection (see para. 4.4)

4.3 First Article Testing. First article testing shall be in accordance with Table 1 and conducted on an LPE capable of producing 225 SCFH of oxygen. Data from the first article tests conducted on the 225 SCFH LPE shall be used to qualify the 170 SCFH LPE by extension.

Prior to the start of testing a test schedule shall be submitted to the Government. (DD1423 A009). Twelve days prior to each test the Government shall also be notified (DD1423 A010).

4.3.1 First Article Test Procedure. Procedures covering all tests and inspections to be conducted for first article shall be prepared in accordance with the data ordering documents specified in the procurement ordering document. (DD1423 A011)

4.3.2 First Article Inspection Report. A first article inspection report shall be prepared in accordance with the data ordering documents specified in the contract or procurement ordering document. (DD1423 A012)

4.4 Quality Conformance Inspection. Quality conformance inspection and testing shall be performed on each component prior to assembly. Each production unit shall undergo tests defined in Table 2. All production units shall be operated for 72 hours at the conditions specified in Table 2. No failures as defined in paragraph 4.7.3 are permitted during the 72 hour acceptance test. Any discrepancies or failures shall be reported to the Government and shall be corrected prior to acceptance. Test reports shall be prepared in accordance with the appropriate CDRL reference. It shall consist of an inspection to confirm the workmanship and uncover omissions or errors made during production, and may include functional and performance tests which detect deviation from design or which test component controls and adjustments.

4.5 Examination

4.5.1 First Article Examination. The first article unit shall be visually examined to determine conformance with the requirements of this specification.

Table 1 - First Article Testing

Test Requirement	Requirement Paragraph	Test Paragraph	Test Required For Complete LPE Unit	Test Required For Controller System and Power Supply Only
Grooming Test		4.6.4	X	
Examination	3.2.1.1, 3.2.1.3, 3.2.1.4 (d), 3.2.1.5, 3.2.1.6, 3.3.5	4.6.1, 4.6.1.1	X	
Insulation Resistance	3.3.3.13	4.6.6.5	X	
Dielectric Withstanding Voltage	3.3.3.14	4.6.6.6	X	
Hydrostatic Test		4.6.2	X	
AC power	3.2.1.4 (a), 3.3.3	4.6.6.1		X
Leakage Current	3.3.3.5	4.6.6.2	X	
Electromagnetic Emission	3.2.2.8	4.6.6.3	X	
DC Magnetic Field	3.2.2.7	4.6.6.4	X	
Temperature	3.2.1.5, 3.2.2.2	Deleted	X	
Hot Spot Data		4.6.7.2.	X (External for all, and internal for non-electronics)	
Airborne and Structureborne Noise Tests	3.2.2.6	4.6.11	X	
Endurance Test	3.2.4	4.6.12	X	
Vibration Test	3.2.2.4	4.6.9	X	
Shock Test	3.2.2.5	4.6.10	X	

Maintainability Demonstration Test	3.2.5	Deleted	X	

Table 2 – Production Unit Testing

Test Requirement	Requirement Paragraph	Test Paragraph	Test Required For Complete LPE Unit	Test Required For Controller System and Power Supply Only
Examination	3.2.1.1, 3.2.1.3, 3.2.1.4 (d), 3.2.1.5, 3.2.1.6, 3.3.5	4.6.1, 4.6.1.1	X	
Hydrostatic Test		4.6.2	X	
Insulation Resistance	3.3.3.13	4.6.6.5	X	
Dielectric Withstanding Voltage	3.3.3.14	4.6.6.6		X
Airborne and Structureborne Noise Tests	3.2.2.6	4.6.11	X	
72 Hr Performance Test		4.6.8	X	

4.6 Tests

4.6.1 Examination. The LPE shall be examined to determine conformance to the requirements of this specification for finish, external dimensions, weight, marking, workmanship and all other requirements specified herein.

4.6.1.1 Visual Inspection. The LPE equipment shall be given a thorough visual examination for the following:

(a) Certification that hardware used is in compliance with the design drawings. Requirement

(b) Nameplates, identification marking, warning labels are correctly installed.

(c) Fit and placement of components is in accordance with design drawings

(d) Mounts and equipment isolation methods are properly installed and no sound shorts exist.

(e) Forms, harnesses, wiring tie downs are in correct location and properly attached.

(f) Cleanliness

(g) Visually inspect all visible components, plumbing, wiring, fittings, connectors, panels, mounts and labels for looseness and/or damage, verify electrical connectors are not mismatched.

(h) Each LPE shall be dimensionally inspected for compliance with the respective ICD.

4.6.2 Hydrostatic Test. All pressurized systems of the LPE shall be hydrostatic tested at 1.5 times maximum operating pressure for at least 15 minutes. Water, nitrogen or air may be used. No external leakage, permanent deformation or damage is permitted. The LPE shall be pressure-drop tested with nitrogen at maximum operating

pressure. The Chilled Water and EAFW piping and connections are exempt from this drop test requirement. The observed pressure drop shall be less than ten percent (temperature corrected) in 6 hours.

4.6.3 Deleted

4.6.4 Grooming Test. The Supplier shall perform a grooming test on the LPE to work out any design problems before starting any other first article tests. Any failures or design problems shall be corrected before start of any other first article tests. Any failures or design problems during the grooming shall be reported to the Government; however, replacement of parts does not require customer approval unless the change results in a material or configuration change to the design. A certification of completion at the end of the grooming testing is required. (DD1423 A031).

4.6.4.1 Electrical Functional Test. Prior to other operating tests, the power supply and controller equipment shall be subjected to a functional test to verify that all electrical components are operating, functioning and meeting the safety requirements specified herein. This test will determine that the power supply and controller are operating properly and are ready for subsequent tests.

4.6.4.2 Electrolysis Process Functional Test. Prior to other operating tests, the electrolysis process equipment shall be subjected to a functional test to verify that all components are operating, functioning and meeting the safety requirements specified herein. This test will determine that the electrolysis process equipment is operating properly and is ready for subsequent tests.

4.6.5 Deleted

4.6.6 Electrical Performance Tests. The LPE electrical controller and power supply shall be tested as specified in the following subparagraphs:

4.6.6.1 AC Power. All tests listed in MIL-STD-1399, Section 300A paragraph 5.3 shall be performed and a report of testing shall be provided to the government. Actual performance of testing is required. Test results shall not be determined by analysis. Voltage and frequency emergency excursions shall be performed separately and then concurrently. The LPE is not required to sustain operation during this test after the voltage and frequency goes above the worst case envelopes. However, the LPE shall not be damaged and shall be capable of returning to normal operation when power is restored within the user tolerance envelope. Voltage and frequency decay testing shall also be performed.

4.6.6.2 Leakage Current. The LPE unit shall be tested to demonstrate compliance with the leakage current requirement of paragraph 3.3.3.5. In accordance with MIL-STD-1399, Section 300A paragraph 5.2.4, ensure no value of capacitance to ground exceeds 0.1 uF.

4.6.6.3 Electromagnetic Emission and Susceptibility Test. The Equipment will be tested in accordance with the requirements of MIL-STD-461 Revision E dated 20 August 1999 for Submarines, Internal to Pressure Hull installations and Methods RS02 (part 1 – magnetic induction spike) & CS06 of MIL-STD-461C. The standoff distance called out in RE101 is increased from 7 cm to 61 cm for all directions except above the unit. Above the unit the standoff distance is increased from 7 cm to 10 cm. The electrolysis power supply shall be loaded with a load which simulates the electrolysis cell during these tests. At the Contractor's option, the electrolysis power supply and LPE control system components may be tested separately or simultaneously. An EMI Test Procedure (EMITP) must be approved by the Government prior to testing. An EMI Test Report must be provided to the Government for approval after the testing is complete. All documentation shall be in accordance with the respective Data Item Descriptions cited in 461E Section 6: Electromagnetic Interference Test Procedures (EMITP) DI-EMCS-80201B and Electromagnetic Interference Test Report (EMITR) DI-EMCS-80200B. (DD1423 A021 and A022)

4.6.6.4 DC Magnetic Field. Electrical equipment shall comply with the requirements of para 3.2.2.7 when tested in accordance with section 070 of MIL-STD-1399. DC magnetic field susceptibility verification may be conducted at the component level or as approved by the Government.

4.6.6.5 Insulation Resistance. The LPE shall be insulation resistance tested in accordance with MIL-HDBK-2036.

4.6.6.6 Dielectric Withstanding Voltage. The LPE electrical equipment shall be dielectric withstanding voltage tested in accordance with MIL-HDBK-2036. Refer to 3.3.314(a).

4.6.7 Thermal Tests

4.6.7.1 Temperature. Testing not required.

4.6.7.2 Hot Spot Data. Temperature measuring instruments shall be placed at critical points throughout the test at suspected "hot spot" areas. This test applies solely to the first article and shall be conducted concurrent with the thermal test. Failure criteria is defined in MIL-STD-454, Requirement 1, paragraph 4.3. Hot spot temperature data may be taken for the electrolysis power supply and control system components during this test.

4.6.8 72 Hour Performance Test. A 72 hour performance test shall be conducted on the fully assembled LPE to verify that it meets the performance requirements of this specification. This test shall be conducted in accordance with a test procedure approved by the Government. This test may be conducted using factory support systems which replicate the conditions produced by the support systems of the ship. This test shall include the following as a minimum:

(a) Verification of component operability, safety and shutdown features prior to actual operation of the system.

(b) All critical parameters of the LPE shall be monitored and recorded on an hourly basis.

(c) Verification of oxygen minimum and maximum production rates.

(d) Verification of oxygen purity.

(e) The unit shall be varied from minimum to maximum rates 6 times during the 72 hour test as follows: 2 hours at minimum output rate, 2 hours at 113 SCFH and 4 hours at the maximum oxygen production rate. The remaining hours shall be conducted at the nominal 113 SCFH setting.

(f) Verification that hydrogen can be discharged against the following discharge pressures: 50, 150, 300, 400, 600 and 750 psi.

(g) Simulation of a hydrogen leak test shall be conducted to demonstrate proper performance of the hydrogen leak detection system.

4.6.9 Vibration Test. The LPE shall be tested per MIL-STD-167-1 to demonstrate conformance to Type I vibration requirements. Each portion of the test (i.e., Exploratory Vibration, Variable Frequency, and Endurance) shall be conducted at frequencies from 4 Hz (or the lowest attainable frequency) to 18 Hz at a double amplitude of 0.006 inches. The equipment shall be energized during vibration testing to simulate normal operation. There shall be no structural damage or degradation to the performance capability to the extent that the equipment is unable to perform its function during and after vibration testing. The equipment shall be fully operational after vibration testing. Operational testing may be performed at a different test facility, if necessary. (DD1423 A013 and A014)

4.6.10 Shock Test. Unless otherwise approved by the Government, the LPE shall be shock tested in accordance with MIL-S-901D, Interim Change No. 1 and data item descriptions DI-ENVR-80708 and DI-ENVR-80709. The following are supplemental requirements to MIL-S-901D Interim Change No. 1, DI-ENVR-80708 and DI-ENVR-80709:

Testing shall be conducted to the requirements of MIL-S-901D Interim Change No. 1 for Heavyweight, Grade A, Type A with unrestricted orientation. The requirements for Heavyweight test series shall consist of four shots. The LPE shall be energized for 30 minutes after shots 1 and 4. During shots 1 and 3, the LPE shall be secured. During shots 2 and 4, the LPE shall be energized but not producing oxygen.

Shot 1 (40 foot standoff with charge arranged fore-aft of barge) shall be replaced by Shot 4R (20 foot standoff where the equipment is rotated 90-degrees about a vertical axis on the floating shock platform). Shots 2, 3 and 4 shall be conducted with standoff distances of 30, 25 and 20 feet respectively. All shots shall simulate explosions from an athwartship direction to the floating shock platform.

During Shot 2 Shot 3, Shot 4R and Shot 4 the equipment shall be configured for its standby mode. At the end of the test series (i.e., after all test shots) the equipment shall be operated and produce oxygen at a rate of 225 SCFH for 30 minutes.

A shock test procedure that meets the requirements of MIL-S-901D Interim Change No. 1 and DI-ENVR-80109 shall be submitted to NAVSEA 05P3 and NSWCCD Code 926 for review and acceptance prior to proceeding with test. Unfilled data sheets shall be provided with acceptance criteria in the test procedure. (DD1423 A015)

A shock test report that meets the requirements of MIL-S-901D Interim Change No. 1 and DI-ENVR-80108 shall be submitted to NAVSEA 05P3 and NSWCCD Code 926 for review and acceptance following shock testing. (DD1423 A016)

Ordering data in accordance with paragraph 6.2.1 of MIL-S-901D Interim Change No. 1 shall be as follows:

(a) Shock test, H.I. (High Impact) Shipboard Machinery, Equipment and Systems, Requirements for, MIL-S-901D with Interim Change No. 1, dated 23 August, 1994.

(b) Test Category: Heavyweight

(c) Applicable shock grade: Grade A

(d) Equipment class: Class I

(e) Shock test type: Type A

(f) Equipment mounting location aboard ship: Deck Mounted

(g) Equipment mounting plane aboard ship: All equipment is to be base mounted aboard the ship.

(h) Equipment mounting orientation aboard ship: Any

(i) Method of mounting items for tests: Test fixtures shall be in accordance with paragraph 3.1.6 to 3.1.6.5 (m) of MIL-S-901D Interim Change #1.

(j) Method of simulating shipboard connections: Shipboard connections shall be simulated in accordance with paragraph 3.1.7.1 of MIL-S-901D Interim Change #1. Per MIL-S-901D Interim Change #1 items shall be mounted for testing in a manner, which dynamically simulates the most severe mounting condition likely to be encountered in the actual shipboard installation. The Government will assist in the development of these requirements when requested by the Contractor.

(k) Modes or conditions of equipment operation to be represented during tests: The equipment shall be energized during shock testing to simulate normal operation.

(i) Shock test acceptance criteria and associated post-test functional testing and inspection requirements: There shall be no structural damage or degradation to the extent that the equipment is unable to perform its function during and after shock testing. Refurbishment of the unit after shock shall be defined in the shock test procedures and shall as a minimum address the following: All damage or deformations shall be repaired. All ball, roller, and journal bearings shall be replaced. All rotating components shall be rebalanced. Undamaged cooling fans shall be exempt from mandatory bearing replacement and rebalancing. The equipment shall be fully operational after shock testing. Operational testing may he performed at a different test facility, if necessary.

The equipment shall not cause a hazard to personnel or Grade A equipment and there shall be no structural failure of the attached joints. An item constitutes a "hazard" if, as a result of shock it is possible for it, or a portion of it, to:

(1) Strike and injure personnel operating or manning Grade A equipment, including personnel at battle stations.

(2) Strike and cause significant impairment or malfunction of Grade A items or systems.

(3) Cause an electrical short (as a result of internal damage or as a result of coming adrift and striking an electrical conductor) in any electrical system. Cause an electrical short which could possibly result in loss of electrical power to a Grade A system, cause functional impairment of a Grade A system, cause ignition of flammable or explosive materials or pose an electric shock hazard to personnel.

(4) Cause release of injurious, flammable, radioactive, acidic, caustic, or otherwise hazardous liquids, solids or gases as a result of internal damage or as a result of coming adrift and striking another item. Exceptions to this criterion, which must be approved by the acceptance authority on a case basis, will be accepted in cases where it can be demonstrated that the nature, location, rate, and total possible amount of leakage is such as to preclude development of a significant threat to personnel, Grade A systems or to the ship as a whole.

(5) Strike Grade A equipment or personnel at battle stations if it comes adrift unless it is apparent that the weight, shape, or other characteristics are such as to preclude unacceptable impact damage, or unless the equipment is contained or prevented from striking Grade A equipment or personnel.

(m) Acceptance authority or authorities: NAVSEA

4.6.11 Airborne and Structureborne Noise Test. The LPE shall be tested to demonstrate compliance with paragraph 3.2.2.6. The LPE shall be operating as directed by the Government during Airborne and Structureborne Noise Testing. Airborne noise shall testing shall be done in accordance with MIL-STD-740-1. Structureborne noise testing shall be done in accordance with MIL-STD-740-2. (DD1423 A017 – A020)

4.6.12 Endurance Test. The LPE shall be operated for a period of 1000 hrs to verify its operational reliability. The gas production rate shall be varied from 15 SCFH, 150 SCFH and 225 SCFH at 40 minute cycles. The 40 minutes cycles shall be repeated for a minimum of 6 hours. For unmanned overnight and weekends the cycles (12 - 80 hours) shall be cycled to the following gas production rates 15 SCFH, 80 SCFH, 170 SCFH and 225 SCFH. The above cycles shall be repeated throughout the 1000 hour Endurance Test. The test parameters identified in section 4.6.8 shall be recorded for each production rate set point. No failures as defined in paragraph 4.7.3 are permitted during the 1000 hour test. Preventive maintenance required to repair seals, electrical connections or adjustments of minor components during the endurance test shall not constitute a retest. After repairs have been made, the test may be resumed. In the case where preventive maintenance is required the Supplier shall provide a Failure Corrective Action Report (FCAR) identifying the preventive action taken and the reason required. In the event of a failure other

than that defined herein, the Government shall be notified immediately. The cause of the failure and certification action required shall be identified and approved prior to restart.

Between hours 900 and 950 of the endurance test, the Contractor shall take a sample of the oxygen output from the LPE when it is operating at each of the production rates specified above, 15 SCFH, 80 SCFH, 170 SCFH and 225 SCFH. Samples shall be sent to an independent laboratory to verify they meet the purity and dew point requirements of this specification.

4.6.13 Maintainability Demonstration Test. Testing not required.

4.7 Testing Program

4.7.1 Test Plans. A unified test plan is required for each of the tests listed in paragraphs 4.6.1 to 4.6.13 of the specification. A test plan shall be submitted for Government approval at least 60 days prior to each test. (DD1423 A023)

4.7.2 Order of Testing. First article testing shall be tested in the sequence shown in Table 1. All electrical tests can be interchanged providing these tests are completed prior to the 72 hour performance, airborne and structureborne noise, endurance, vibration, shock, and maintainability tests. Production units as a minimum must pass the test sequence shown in Table 2. Any order of testing, other than those specified to facilitate combining of tests and/or minimizing utilization of test facilities, must be approved by the Government. The First Article unit shall be prepared for delivery in the unrefurbished condition.

4.7.3 Failure Criteria. The equipment, or portions thereof, subjected to a test specified herein shall be considered to have failed the tests when the test conditions specified herein are not met. Test shutdowns associated with loss of facility power or other test equipment failures will not constitute a failure. (See para.4.7.4.) (DD1423 A025)

4.7.4 Retest Conditions. Any time a failure occurs (per para. 4.7.3), the test shall be discontinued. Test shutdowns associated with loss of facility power or other test equipment failures will not constitute a retest. Action shall be taken to determine the cause of failure and to correct the deficiency. Verification of corrective action shall be accomplished by a complete retest, or as directed by the Government at the time. For the maintenance test, in the event a reject decision is reached, the Supplier shall conduct a design review to determine an effective method for reducing the maintenance time to acceptable limits. After the correction has been accomplished, a complete retest shall be conducted.

4.7.5 Design Changes. Design changes resulting from the tests as approved by the Government shall be reflected in the delivered hardware and in the final engineering drawings and all documentation.

4.7.6 Test Reports. A report detailing the results of all First Article tests conducted shall be submitted to the Government. A report detailing the results of production unit testing for each unit shall be submitted to the Government for each production unit. (DD1423 A024).

5. DELIVERY

5.1 Packaging and Shipping. Production LPE hardware, interim repair parts, and installation and checkout repair parts shall be cleaned, preserved, packaged, and marked in accordance with MIL-STD-2073-1 for level A protection. The electrolysis cell shall be kept from freezing and may be packaged separately when the LPE unit is shipped to the Government.

5.1.1 Standard Handling and Storage. To the maximum practical extent, all end items shall be packaged to facilitate standard handling and storage, in accordance with paragraph 5.1.

5.1.2 Special Handling and Storage. All special handling during packaging, transportation and storage shall be identified and reviewed with the Government prior to shipment. Special provisions to prevent freezing or maintain nitrogen blanket cover on key components shall be clearly marked on the appropriate containers.

6. TECHNICAL MANUALS

Technical manuals are required, specifications and standards that have been cleared and listed in DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be listed on a separate Contract Data Requirements List (DD Form 1423), which is included as an exhibit to the contract. Submittal must be in accordance to DD Form 1423-1, Sequence No. A029.

6.1 Unless otherwise specified in the contract or order, technical manuals shall be prepared in accordance with MIL-M-24784. Preliminary manuals shall be submitted to the design review agency for approval and shall include all proposed sections completed. Unless otherwise specified in the contract or order, manuals shall include system components, assemblies, subassemblies and applicable drawings. Performance curves shall be furnished with the final manuscript.

6.2 Manuals shall include master drawings and certification data covering the complete operation, maintenance and calibration instructions of all electrical equipment, and instrumentation, including the controller/PLC, software instructions, etc.

6.3 Each manual shall include not less than the following illustrations covering the LPE:

6.3.1 Sectional assembly drawing.
6.3.2 Outline drawing.
6.3.3 Complete list of material corresponding to the sectional assembly drawing.
6.3.4 Certification data.

6.4 A minimum of two drawings of the complete system, taken 180 degrees apart on a horizontal plane shall be provided.

6.5 The calibration and alignment procedure instructions shall describe in complete detail the means by which the required calibration and alignment are to be established. Exceptions to any part of those requirements in any specific area may be granted only by providing a written technical justification for the said exception to the design review agency for approval.

6.6 The quantity and distribution of the technical manuals shall be as specified in the contract.

7 LPE SIMULATOR

The LPE Simulator shall be suitable for training LPE operators and electrical technicians. It shall be a near tactical unit similar in operation, fault simulation and componentry to the LPE simulators housed at the Naval Submareine School in Kings Bay, GA and Bangor, WA. It shall be capable of simulating LPE startup/shutdown and steady-state operation. It shall not require any hazardous materials. Part Task Trainers (PTT) shall be housed within the LPE

simulator to facilitate training on all significant or unique LPE maintenance actions. Fault insertion and fault isolation shall be available to facilitate troubleshooting instruction. The LPE Simulator shall be capable of simulating all significant fault shutdowns. Submittal must be in accordance to DD Form 1423-1, Sequence No. A036-A043.

8 LIFTING RIG

The contractor shall provide a means to safely move the fully assembled LPE using an overhead crane.

SECTION F - DELIVERIES OR PERFORMANCE

The following Delivery Schedule item for CLIN 0003 has been changed from:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC
13-OCT-2017	6	NAVAL SURFACE WARFARE CENTER PHILA (b) (6) NSWC PHILADELPHIA DIVISION NSLC DETACHMENT 1601 LANGLEY AVE, (b) (6) PHILADELPHIA PA 19112-5051 (b) (6) FOB: Origin (Shipping Point)	N64498

To:

DELIVERY DATE	QUANTITY	SHIP TO ADDRESS	DODAAC
30-NOV-2018	6	NAVAL SURFACE WARFARE CENTER PHILA (b) (6) NSWC PHILADELPHIA DIVISION NSLC DETACHMENT 1601 LANGLEY AVE, (b) (6) PHILADELPHIA PA 19112-5051 (b) (6) FOB: Origin (Shipping Point)	N64498

SECTION I - CONTRACT CLAUSES

The following have been added by reference:

52.232-32	Performance-Based Payments	APR 2012

SECTION J - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACHMENTS

The below Table of Contents has been added

Exhibit/Attachment Table of Contents

DOCUMENT TYPE	DESCRIPTION	PAGES	DATE
Attachment 1	DD254	6	19-OCT-2016

(End of Summary of Changes)